

An Analysis of the Genera of Surgeon Fishes (Family Acanthuridae)<sup>1</sup>

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THE GENERA OF FEW families of tropical marine fishes have been as badly confused as those of the Acanthuridae. Ahl (1923: 36) and others have pointed out the need for a review of the generic classification of the family. As may be seen in the key below, the genera are easily distinguished; most of the inconsistency with respect to use of names has been purely nomenclatorial.

The genera fall into two major groups on the basis of the armature of the caudal peduncle. Four of them, *Acanthurus*, *Ctenochaetus*, *Zebrasoma*, and *Paracanthurus*, are characterized by a single folding spine on each side of the peduncle. *Naso* and *Prionurus* have one to six fixed spines or plates in this region. Such a clear-cut distinction might tempt one to treat the two groups as subfamilies. There is, however, a sharing of other important characters by various genera in both groups which makes such a consideration untenable. In this paper the phylogenetic interrelationships of the surgeon fish genera are discussed, and an attempt is made to put the generic classification in order.

The four genera with the single folding spine on the caudal peduncle are being revised. The revision of *Ctenochaetus* is completed (Randall, 1955). Those of *Zebrasoma*, *Paracanthurus*, and *Acanthurus* will follow.

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KEY TO THE GENERA OF ACANTHURIDAE

- 1a. 1 to 6 immovable keel- or thorn-like spines or laminae on each side of caudal peduncle; least depth of caudal peduncle contained 3.5 to 6 times in length of head; dorsal and anal spines stout. . . . . 2
- 1b. A single folding spine on each side of caudal peduncle; least depth of caudal peduncle contained 2.1 to 3.5 times in length of head; dorsal and anal spines slender (except *Paracanthurus*) . . . . . 3
- 2a. 1 to 2 pairs of caudal spines or laminae; pelvic fin rays I, 3; anal spines II; dorsal spines IV to VII; teeth small, conical with tips slightly compressed, smooth or with very small denticulations. (Indo-West-Pacific) . . . . . **Naso**
- 2b. 3 to 6 pairs of caudal spines or laminae; pelvic fin rays I, 5; anal spines III; dorsal spines VIII or IX; teeth moderately large, flattened, close-set, with large denticulations. (Japan, Australia, tropical eastern Pacific, Galapagos Islands) . . . . . **Prionurus**
- 3a. Pelvic fin rays I, 3; scales on head modified to tuberculated plates. (Indo-West-Pacific) . . . . . **Paracanthurus**
- 3b. Pelvic fin rays I, 5; scales on head not modified to tuberculated plates. . . . . 4
- 4a. Dorsal spines VI to IX (usually VIII or IX); length of longest dorsal ray contained 3.5 to 6 times in standard length;

scales not elevated and ctenii not long; least depth of caudal peduncle 2.1 to 3.2 in length of head; caudal peduncle spine in a sharply-defined groove . . . . . 5

4b. Dorsal spines IV or V; length of longest dorsal ray contained 2.2 to 3.8 times in standard length; scales elevated and with long ctenii; least depth of caudal peduncle 3 to 3.5 in length of head; caudal peduncle spine in a shallow depression. (Indo-West-Pacific) . . . . . *Zebrasoma*

5a. Teeth fixed, not attenuate with expanded incurved tips, denticulate on both lateral and medial margins, and not over 26 in upper jaw; dorsal spines IX (except one species with VI or VII and two with VIII). (Circumtropical) . . . *Acanthurus*

5b. Teeth movable, attenuate with expanded incurved tips which bear only lateral denticulations, and from 30 to 60 in upper jaw (of specimens over 75 mm. in standard length); dorsal spines VIII. (Indo-Pacific) . . . . . *Ctenochaetus*

The relationship of the existing genera of surgeon fishes is not easily fitted into a conventional family tree pattern. Aoyagi (1943: 196) has constructed such a tree for the Acanthuridae on the basis of dentition alone. For this one character his conclusions are well drawn. *Naso*, with its conical teeth, is listed as most primitive. *N. lituratus* (Bloch and Schneider) and *N. unicornis* (Forskål) exemplify those species of this genus which have teeth lacking denticulations. Others, like *N. hexacanthus* (Bleeker), have tiny denticulations and are higher in the evolutionary sequence. *Prionurus*, *Paracanthurus*, *Zebrasoma*, and *Acanthurus* are progressively more specialized, though these four genera are basically similar. The teeth have become close-set, flattened, and strongly denticulate. *Ctenochaetus*, which has comb-like teeth, is portrayed as being derived from *Acanthurus*.

This picture is strengthened by a consideration of food habits of the genera. The acan-

thurids, in general, are herbivorous. *Naso* tends to feed on leafy algae such as *Sargassum*; its teeth are not efficient for feeding on slick, filamentous algae. The flattened, denticulate teeth of the next four genera might represent a specialization for feeding on fine algae. *Ctenochaetus* with its numerous, long, protruding teeth can feed effectively on loose algal filaments and other detrital material on the bottom.

When, however, characters other than dentition are considered, the interrelationships of the genera are not so simple. *Naso* and *Prionurus*, both with fixed caudal spines, have different numbers of pelvic rays. *Paracanthurus*, which has a movable caudal spine and is separated from *Naso* by *Prionurus* in the phyletic line of Aoyagi, has a pelvic formula of I, 3 like *Naso*. It appears then that the reduction in pelvic fin rays from I, 5 to I, 3 must have occurred independently in *Naso* and *Paracanthurus* or that the I, 5 condition was secondarily regained in *Prionurus*. The dorsal spines in *Naso* are IV to VII. In *Prionurus* and *Paracanthurus* they are VIII or IX. In *Zebrasoma* they drop to IV or V, and in *Acanthurus* and *Ctenochaetus* they increase again to VIII or IX. The scales present an even more perplexing problem. The supposedly advanced genera, *Acanthurus* and *Ctenochaetus*, have ctenoid scales which are less specialized than the unusual raised and often spinulous scales of the other genera. It is difficult to place *Acanthurus* in a more primitive position than *Naso*, however, for it does not seem that a folding caudal spine and denticulate teeth could precede a fixed spine and smooth teeth. Perhaps the linear pattern of evolution postulated by Aoyagi would be less likely than one which supposes that all the Recent genera (except *Ctenochaetus*, which does appear to be derived from *Acanthurus*) arose from common stock at essentially the same period of geologic time.

Eastman (1904a) has commented on the sudden appearance in the Eocene of a host of modern teleost types, many of which were



as highly specialized then as they are today. The fossil record of the Acanthuridae indicates that both *Naso* and *Acanthurus* date back to the Eocene (Agassiz, 1838; Woodward, 1901; Eastman, 1917), thus these are among the specialized genera making the apparent sudden appearance in the early Tertiary.

Hussakof (1907) recorded a fossil *Zebrosoma* (as *Z. deani*) from the West Indies. The specimen, which was well preserved, was considered possibly of Eocene age. In my opinion this fish is not a *Zebrosoma*. It lacks the great depth of body and elevated fins of this genus. Also there is a very narrow caudal peduncle and a crescentic (high and narrow) caudal fin, and no caudal peduncle spines were located. Of existing genera, it seems closest to *Naso*. This specimen, which was deposited in the American Museum, should be re-examined and its position within the Acanthuridae re-evaluated.

Two extinct genera, *Aulorhamphus* de Zigno (Eocene) and *Apostasella* Whitley (new name for *Apostasis* Gorjanovič-Kramberger) (Oligocene-Miocene) have been included in the Acanthuridae although no caudal peduncle spines have been found for these forms. Ogilby (1916: 173) views "with grave suspicion" the inclusion of these genera in the surgeon fish family. I concur in this doubt.

The fossil *Acanthurus gaudryi* de Zigno and *A. gazolae* Massalongo were considered by Woodward (1901) and Eastman (1904a) as not belonging to the genus *Acanthurus*. Woodward believed they might be better placed in the Chaetodontidae. Eastman thought them types of distinct genera, but preferred to include them in *Pygaus* Agassiz, the limits of which were widely extended by Agassiz. In Jordan's opinion (Eastman, 1904b), *Pygaus* is a generalized type ancestral to the Chaetodontidae, Acanthuridae, and Teuthididae (Siganidae). Berg (1947: 482) thought the VIII or IX anal spines of some *Pygaus* allies it more closely with the latter than with the other two families.

It is evident that more study of the fossil Acanthuridae and related families is needed, with especial effort to integrate knowledge of fossil with that of present forms and to reconstruct the evolutionary picture in more precise terms.

#### Genus NASO Lacépède

*Naso* Lacépède, 1801. Hist. nat. poiss. Vol. 3, p. 105. (Type species by subsequent designation (Valenciennes, 1837, pl. 72, fig. 1), *Naso fronticornis* Lacépède = *Chaetodon unicornis* Forskål.)

*Monoceros* Bloch and Schneider, 1801. Syst. ichth. p. 180. [Preoccupied by Lacépède (*ex* Plumier), 1798. Hist. nat. poiss. Vol. 1, p. 357, in reference to a balistid.]

*Nasonus* Rafinesque. 1815. Anal. natur. p. 88. (Substitute name for *Naso*.) [Reference after Gill, 1885.]

*Priodon* Quoy and Gaimard. Voyage autour du monde . . . Uranie . . . Zool. p. 377. (Type species, *Priodon annulatus* Quoy and Gaimard.)

*Naseus* Cuvier. 1829. Règne animal. Ed. 2, vol. 2, p. 224. (Type species, *Naso fronticornis* Lacépède = *Chaetodon unicornis* Forskål.)

*Priodontichthys* Bonaparte, 1833. Saggio. distrib. metod. anim. vert. p. 34. (Type species, *Priodon annularis* Cuvier and Valenciennes = *Priodon annulatus* Quoy and Gaimard.) [Reference after Gill, 1885.]

*Axinurus* Cuvier and Valenciennes, 1835. Hist. nat. poiss. Vol. 10, p. 299. (Type species, *Axinurus thynnoides* Cuvier and Valenciennes.)

*Keris* Cuvier and Valenciennes, 1835. Hist. nat. poiss. Vol. 10, p. 304. (Type species, *Keris anginosus* Cuvier and Valenciennes.)

*Callicanthus* Swainson, 1839. Nat. hist. . . . fishes . . . Vol. 2, p. 256. (Type species, *Aspisurus elegans* Rüppell = *Acanthurus lituratus* Bloch and Schneider.)

*Ceris* Kner, 1865. Akad. Wiss. Wien, Denkschr. 24: 6.

*Cyphomycter* Fowler and Bean, 1929. U. S. Natl. Mus., Bul. 100, vol. 8, p. 264. (Type species, *Naso tuberosus* Lacépède.) (Proposed as a subgenus; raised to generic rank by Smith, 1951: 1126.)

*Prionolepis* Smith, 1931. Albany Mus., Rec. 4: 125. (Type species, *Prionolepis bewitti* Smith = *Chaetodon unicornis* Forskål.)

The genus *Naso* has been split by some authors into two or more genera. A frequent basis for this division has been the presence or absence of a horn on the forehead in adults. I do not believe that this is a valid means of separation in view of the late appearance of this character, the difficulty at times in assessing what is a horn and what a mere bony prominence, and the demonstration by Smith (1951: 1126) that the horn occurs only on the male in *Naso rigoletto* Smith.

The use of the name *Axinurus* Cuvier and Valenciennes by Fowler and Bean as a subgenus for *Naso thynnoides* (Cuvier and Valenciennes), which has a single buckler on each side of the caudal peduncle, seems more reasonable than applying this name as a genus as has Smith (1951: 1126).

Quoy and Gaimard (1824: 375) erroneously used the generic name *Aspisurus* Lacépède (= *Acanthurus* Forskål) for a species of *Naso*. Lesson (1830: 151) did the same with *Prionurus* Lacépède. Shaw (1803) applied the name *Acanthurus* to all of the species of surgeon fishes (which included *Naso*) in his *General Zoology*. Jordan and Fowler (1902: 558) used *Acanthurus* for species of *Naso* which have an elongate horn on the forehead in the adult (see section under *Acanthurus* for discussion of this).

*Keris* and *Prionolepis* were proposed for the late postlarval stage of *Naso*.

#### Genus PRIONURUS Lacépède

*Prionurus* Lacépède, 1804. Mus. Natl. de Hist. Nat., Ann. 4: 211. (Type species by mono-

typy, *Prionurus microlepidotus* Lacépède.)

*Xesurus* Jordan and Evermann, 1896. Checklist fishes N. and Middle America. P. 421. (Type species, *Prionurus punctatus* Gill.)

*Acanthocaulus* Waite, 1900. Australian Mus., Rec. 3: 206. (Substitute name for *Prionurus*.)

*Burobulla* Whitley, 1931. Australian Zoologist 6: 321. (Type species, *Xesurus maculatus* Ogilby.)

*Triacanthuroides* Fowler, 1944. Acad. Nat. Sci. Phila., Monog. 6, p. 332. (Type species, *Naseus latilavus* Valenciennes.)

*Xesurus* is distinguished from *Prionurus* by having three to four instead of six keeled laminae on each side of the caudal peduncle. I do not believe that the number of caudal laminae is of generic significance (a specimen of *Prionurus microlepidotus* Lacépède from Port Jackson, Australia, United States National Museum No. 47964, has five keeled laminae on one side of the caudal peduncle and six on the other), and in view of the lack of other differences, I place *Xesurus* in the synonymy of *Prionurus*. There is less basis for the recognition of *Xesurus* than there is for the division of *Naso* into two or more genera.

As pointed out by Gill (1904: 121) Waite was in error in proposing *Acanthocaulus* as a substitute for *Prionurus*. He did so in the belief that *Prionurus* was established by Lacépède in 1830 instead of 1804. In 1829 *Prionurus* was proposed by Ehrenberg in the Arachnida.

The type species for *Burobulla* Whitley and *Triacanthuroides* Fowler clearly belong in the genus *Prionurus*.

#### Genus PARACANTHURUS Bleeker

*Paracanthurus* Bleeker, 1863. Ned. Tijdschr. Dierk. 1: 252. (Type species by monotypy, *Acanthurus hepatus* (Linnaeus) Bloch and Schneider = *Teuthis hepatus* Linnaeus, as restricted by Cuvier and Valenciennes.)



*Colocopus* Gill, 1885. U. S. Natl. Mus., Proc. 7: 277, 279. (Type species, *Colocopus lambdurus* Gill = *Teuthis hepatus* Linnaeus, as restricted by Cuvier and Valenciennes.)

Günther (1873: 115) and subsequent authors continued to use *Acanthurus* for the one known species of the genus *Paracanthurus* after its proposal by Bleeker. The name *Paracanthurus* was unnoticed until Fowler (1926: 139) pointed out that it preceded *Colocopus* Gill.

#### Genus ZEBRASOMA Swainson

*Harpurus* Swainson, 1839. Nat. hist. . . . fishes . . . Vol. 2, p. 256. (Not *Harpurus* of Forster, 1778.)

*Zebrasoma* Swainson, 1839. Nat. hist. . . . fishes . . . Vol. 2, p. 256. (Type species by monotypy, *Acanthurus velifer* Bloch.)

*Scopas* Kner, 1865–67. Reise . . . fregatte *Novara* . . . Fische. P. 212. (Type species, *Acanthurus scopas* Cuvier and Valenciennes.) (*Scopas* of Bonaparte, 1831, a *nomen nudum*.)

*Laephibichthys* Ogilby, 1916. Queensland Mus., Mem. 5: 173. (Type species, *Acanthurus rostratus* Günther.)

Bleeker (1851) and other authors after him persisted in using the generic name *Acanthurus* for species of *Zebrasoma*, probably without the realization that the latter had been proposed.

Ogilby established the genus *Laephibichthys* for the species *Acanthurus rostratus* Günther on the basis of the unusually long snout and thick dorsal spines as shown in a painting by Garrett. Examination of 13 specimens, among them two collected by Garrett from the Society Islands and probably the ones from which the painting was made, revealed considerable variation in snout length. Some specimens had shorter snouts than the average snout length of *Zebrasoma flavescens* (Bennett) or *Z. scopas* (Cuvier). None had thick dorsal spines. No other differences even approaching generic level could be found between *Z. ros-*

*tratus* and species of *Zebrasoma*; thus *Laephibichthys* is not well founded.

Jordan and Jordan (1922: 66) used the name *Scopas* as a subgenus for *Z. flavescens* to emphasize its distinctness from *Zebrasoma* (*Zebrasoma*) *veliferum* (Bloch). *Z. gemmatum* (Cuvier and Valenciennes) tends to invalidate this subgeneric concept, for it has a tooth structure and fin ray counts approaching that of *veliferum*, yet it lacks the extremely elevated dorsal fin of this species and has a body form more like other *Zebrasoma*.

Von Bonde (1934: 449, fig. 3) described a new species of acanthurid, *Hepatus coccinatus*, from Zanzibar. His description and photograph leave little doubt that his specimens are *Zebrasoma veliferum*, although he gave the dorsal spine count as VII instead of the usual IV.

#### Genus ACANTHURUS Forskål

*Hepatus* Gronow, 1763. Zoophylacium . . . p. 113. (Nonbinominal.)

*Teuthis* Linnaeus, 1766. Syst. nat. Ed. 12, vol. 1, p. 507. (Linnaeus included in *Teuthis* several acanthurids and a siganid under the one name *hepatus*. In Opinion 93 of the International Commission on Zoological Nomenclature the siganid, *T. javus*, was fixed as type.)

*Acanthurus* Forskål, 1775. Descr. animalium. P. 59. (Type species by subsequent designation (Jordan 1917: 33), *Chaetodon sobal* Forskål.)

*Harpurus* Forster, 1778. Enchiridion hist. nat. . . . p. 84. (Type species, *Harpurus fasciatus* Forster = *Chaetodon triostegus* Linnaeus.) [Reference after Jordan, 1917.]

*Rhombotides* Walbaum, 1792. (ex Klein, 1775, nonbinominal.) Petri Artedi . . . ichthyologiae pars iii, p. 582.

*Aspisurus* Lacépède, 1802. Hist. nat. poiss. Vol. 4, p. 556. (Type species, *Chaetodon sobal* Forskål.)

*Teuthys* Swainson, 1839. Nat. hist. . . . fishes . . . Vol. 2, p. 255.

*Ctenodon* Swainson, 1839. Nat. hist. . . . fishes . . . Vol. 2, p. 255. (Preoccupied by *Ctenodon* Wagler, 1830.)

*Acronurus* Gronow, 1854. Cat. fish collected . . . p. 190. (Type species, *Acanthurus argenteus* Quoy and Gaimard.)

*Zabrasoma* Seale, 1901. Bernice P. Bishop Mus., Occ. Pap. 1: 110.

*Harpurina* Fowler and Bean, 1929. U. S. Natl. Mus., Bul. 100, vol. 8, p. 253. (Type species, *Hepatus nubilus* Fowler and Bean.) (Proposed as a subgenus; raised to generic rank by de Beaufort, 1951: 165.)

Forskål (1775: 59) proposed *Acanthurus* as a subgeneric category of *Chaetodon*, and in it he included *unicornis*, *sobal*, *nigrofusus*, and *gabhm* (the latter was considered by him as a variant of *nigrofusus*). None of these was designated by him as the type species. Lacépède (1801: 105) established the genus *Naso* and listed *unicornis* as a synonym of his *Naso fronticornis* (even though *unicornis* is an earlier name). Also (1802: 556) he removed *sobal* (erroneously as *sobar*) from *Acanthurus* and erected the genus *Aspisurus* for this one species. *Aspisurus* has properly been placed back in *Acanthurus*; *unicornis* remains in *Naso*. Valenciennes (1837: pl. 71, fig. 2) figured *Acanthurus xanthopterus* Cuvier and Valenciennes as the type species of *Acanthurus*. Gill (1885: 278) listed "*Teuthis hepatus* Linnaeus = *Acanthurus chirurgus* Bloch" as the type. Neither of these type designations is valid, for these species were not among those included by Forskål in *Acanthurus*.

Jordan and Fowler (1902: 558) used the genus *Acanthurus* for species of *Naso* which have the frontal horn, under the belief that *unicornis* should be considered as the type of *Acanthurus* since it was the first species listed by Forskål in his subgeneric category *Acanthurus*. I quote Jordan and Fowler: "The first species named by Forskål, *unicornis* being

taken as its type, *Acanthurus* becomes equivalent to *Monoceros*." Later Jordan (1917: 33) selected *Chaetodon sobal* Forskål as the type species of *Acanthurus*, and both Jordan and Fowler reverted to the usual use of *Naso*. Should Jordan and Fowler's statement on *unicornis* be construed as a valid type designation, I would recommend application to the International Commission on Zoological Nomenclature to preserve the common usage of *Acanthurus* and *Naso*.

According to Opinion 21 of the International Commission on Zoological Nomenclature, the genera of Klein (1744) do not gain nomenclatorial status by reason of being quoted by Walbaum (1792); thus *Rhombotides* is not valid. Bleeker often used this name instead of *Acanthurus*.

The genus *Harpurina* Fowler and Bean, in which de Beaufort (1951: 165) placed the single species *nubilus* Fowler and Bean, is characterized primarily by small teeth and VI or VII dorsal spines. *Acanthurus thompsoni* (Fowler) and *A. bleekeri* Günther have the same type of dentition (and other similarities), but the usual IX dorsal spines. They serve to connect *nubilus* with more typical species of *Acanthurus*; thus I do not believe that *Harpurina* is a valid genus.

Fowler (1944: 109) established the subgenus *Rhomboteuthis* for the species *Acanthurus coeruleus* Bloch and Schneider on the basis of its deep body, long pectoral fins, and small caudal spine. If only the Atlantic species of *Acanthurus* were classified, such a subgenus might be a useful criterion, but it breaks down when the Indo-Pacific forms are considered, for some, like *Acanthurus guttatus* Bloch and Schneider and *A. nubilus*, have a body depth as great or greater and pectoral fins as long as *A. coeruleus*, and *A. triostegus* (Linnaeus) has a smaller caudal spine. None of these species could be grouped with *coeruleus* to form a natural subgeneric category apart from other species of *Acanthurus*. Better subgenera could be formed by grouping *A. achilles* Shaw, *A. glaucopareius* Cuvier, and *A.*



*leucosternon* Bennett or *A. nubilus*, *A. bleekeri* Günther, and *A. thompsoni* (Fowler); however, I do not believe that even these are advisable.

The late postlarval *Acanthurus* is quite different from the juvenile. It is more disc-like, transparent in life with silvery abdomen, and naked with vertical striae or folds on the body. It is not difficult to understand why Gronow erected *Acronurus* for this stage and how this genus persisted so long in the literature. Although now well known to be larval, *acronurus* remains as a common name for the late postlarval stage of *Acanthurus*. Some authors apply the designation to all postlarval acanthurids.

The type species of *Acronurus* by subsequent designation is *Acanthurus argenteus* Quoy and Gaimard. As indicated by Randall (in press), this species may be the young of *Ctenochaetus striatus* (Quoy and Gaimard). If this could be conclusively demonstrated, the generic name *Ctenochaetus* would have to be replaced by *Acronurus*. Under such circumstances, it would be advisable to apply to the International Commission on Zoological Nomenclature to conserve the name *Ctenochaetus*. Nearly all use of *Acronurus* has been for the young of *Acanthurus*.

Swainson (1839) listed *Teuthys* as a surgeon fish genus (an emendation or erroneous spelling for *Teuthis* Linnaeus) for the single species *Acanthurus argenteus* Quoy and Gaimard. His brief description of the genus obviously applies to an *acronurus*. Linnaeus, however, did not include any *acronurus* forms in *Teuthis*.

Seale placed in *Zabrasoma* (probably a typographical error for *Zebrasoma*), his new species *agaña* (= *flavescens*) and a species of *Acanthurus* (*A. guttatus*). He apparently mistook *A. guttatus* for a *Zebrasoma* because of its high body.

#### Genus CTENOCHAETUS Gill

*Ctenodon* Klunzinger, 1871. Synopsis Fische Rothen Meeres. Pt. 2, p. 509. (Preoccupied by *Ctenodon* Wagler, 1830.)

*Ctenochaetus* Gill, 1885. U. S. Natl. Mus., Proc.

7: 279. (Type species by original designation, *Acanthurus strigosus* Bennett.)

*Ctenodon* was first proposed by Wagler (1830) for a reptile. Swainson (1839) used the same generic name for five species of *Acanthurus* and one *Ctenochaetus*. Klunzinger applied the name as a subgenus for the species *Acanthurus ctenodon* Cuvier and Valenciennes (= *Acanthurus striatus* Quoy and Gaimard) and *Acanthurus strigosus* Bennett. Fowler (1904: 545) elevated Klunzinger's subgenus to a genus.

The use by Day (1889: 143) (and subsequent authors) of *Acanthurus* for *Ctenochaetus* (and *Teuthis* for *Ctenochaetus* by Barnard, 1927: 780) appears to be due to ignorance of Gill's name *Ctenochaetus* for this well-differentiated genus.

As is indicated in the discussion of *Acronurus* in the section on *Acanthurus* there is a possible question as to the validity of the name *Ctenochaetus*.

#### SUPPLEMENTAL NOTE

After the present paper was submitted, an article by Prof. J. L. B. Smith, entitled *East African Unicorn Fishes from Mozambique*, appeared in the South African Journal of Science (65 (6): 169–174). Five genera (here considered only as the single genus *Naso*) and *Prionurus* were split off from the Acanthuridae on the basis of caudal armature and placed in a separate family, the Nasidae.

If only the genera *Naso* and *Acanthurus* were considered, such a division would be tenable. It is not, however, when all of the genera are considered. *Paracanthurus* has the single folding caudal spine, strongly denticulate teeth, IX dorsal and III anal spines like *Acanthurus*, but I, 3 pelvic rays and thickened dorsal spines like *Naso*. *Prionurus*, linked with *Naso* by Smith because of the three to six fixed caudal spines or laminae on each side of the caudal peduncle, has a pelvic formula of I, 5, VIII or IX dorsal and III anal spines, and dentition similar to *Acanthurus*. *Zebrasoma* would seem to be allied with *Acanthurus* in caudal armature and other characters, yet it has a reduced dorsal spine count like *Naso*.

Smith divides *Naso* as here defined into the five genera *Axinurus*, *Naso*, *Cyphomycter*, *Calli-*

*canthus*, and *Atulonotus*, the latter being erected for the species *Naso hexacanthus* (Bleeker) and *Naso vomer* (Klunzinger). He distinguishes *Atulonotus* from *Axinurus* by its possession of two instead of one plate on each side of the caudal peduncle, teeth with serrate edges; from *Callicanthus* by the presence of pointed teeth and from *Naso* and *Cyphomycter* by the lack of a conical frontal horn or swollen region at all stages. As previously discussed, the number of caudal plates and the presence or absence of a prominence on the forehead are not, in my opinion, characters of generic magnitude in the *Naso* group. Even dentition does not provide a consistent basis for separation. The teeth of *Naso unicornis*, although usually serrate, may be smooth, as indicated in Plate 3, Figure 1 of Aoyagi (1943). Therefore I leave *Naso* undivided and place *Atulonotus* in synonymy.

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